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EDITORIALS

Antiviral Processes

Viruses may be thought of as tiny living parasites, which have degenerated from higher forms of life such as bacteria and protozoa and which borrow energy, supplies and organization from the host cell.

Although a scarcity of antiviral processes exists in nature, several diverse considerations can be brought to bear in the study of them. The degeneration of higher forms of life which leads to viruses consists in the loss of one functional unit after another, with corresponding borrowing from the host cell, to which the virus soon becomes a complete parasite. Presumably these functional units are enzyme systems. Ultimately only a single unit may be postulated, which is a self-duplicating unit borrowing entirely the energy and organization of the cell.

Using this hypothesis, it is possible to visualize a corresponding line of chemotherapeutic agents, and, in part, facts may be mustered to support the idea. Thus bacteria and protozoa are susceptible to the action of many chemotherapeutic agents. Pleuropneumonia organisms and leishmanias, which are one step smaller, though not completely parasitic, are susceptible to treatment with heavy metals. Descent to the lymphogranuloma and psittacosis group and to the rickettsias, where parasitism is obligate, still does not remove the microorganisms from attack by sulfonamides and penicillin, and by para-aminobenzoic acid, respectively. The final step to viruses proper is not a great one, and hence is to be anticipated in due course of time.

The first of the antiviral processes is the natural one of antibody production. Thus, active immunization against smallpox is of the highest order, while immunization to influenza, rabies, certain encephalitides, and, experimentally, even to measles and mumps, is more or less highly developed. Passive immunization is less rewarding, partly because its effect appears to be limited to a few virus infections in which man is the only convenient host, and hence the production of antibody in another species is impossible; and partly because the inaccessibility of the virus, hidden as it is within the host cells, prevents contact with antibody. Nevertheless, measles virus is subject to destruction by antibody, perhaps during its fleeting extracellular periods, and the disease is amenable to favorable influence by antibody preformed in another human—whether presented as blood from convalescents, or from pools of adults most of whom will have had the disease. In the second case it is most elegantly available as gamma globulin. The blood of patients convalescent from mumps and from infectious hepatitis may also contain antibodies which can influence the course of the corresponding diseases.

A second process, also using natural mechanisms, is based on the "interference phenomenon." In this situation, the presence of one virus within a cell may prevent or interfere with the entry of a second virus into the same cell. Thus, it is possible in some instances, to protect the organism from a harmful virus by a harmless one. In the best example, fox distemper may be limited by the injection of an attenuated variant, even when the latter is given some days after the time of the original infection.

In addition to natural antagonisms, man-made antiseptics may also be turned against viruses. The strong, heroic antiseptics like phenol are, of course, not applicable within the body, unless perhaps as caustics to destroy rabies virus in a wound. Mists of triethylene glycol, however, may be used to inactivate influenza virus in a room or ward.

Greater interest is aroused by the more subtle antiseptics. These are compounds of gentle action, which, probably by successful competition with necessary metabolites, in one way or another result in the death of a pathogenic organism without harming the host. With the precedent of the sulfonamides, the antibiotics, and quinacrine, such action against viruses is plausible, notwithstanding the protected intracellular position of the virus; and, in fact, minor effects have been demonstrated by several workers. Metabolites normally enter and leave cells freely, and in altered form this travel should still be possible.

Processes useful in seeking out the virus without harming the cell are still largely speculative, but the problem appears to be far from hopeless.